

# Engineering Data

## Stromberg-Carlson Nos. 48, 49, 50, and 51 Radio Receivers

STROMBERG-CARLSON TELEPHONE MANUFACTURING COMPANY  
Rochester, New York

### ELECTRICAL SPECIFICATIONS

Type of Circuit.....	Superheterodyne
Type and Number of Tubes.....	No. 58, 1 No. 57, 3 No. 56, 1 No. 55, 2 No. 2A3, 1 No. 5Z3
Voltage Rating.....	105-125 Volts
Frequency Range.....	60 Cycles and 25-60 Cycles
Power Consumption (Maximum at 125 Volts).....	160 watts

### CIRCUIT DESCRIPTION

The three No. 58 tubes are used as R. F. amplifier, mixer, and I. F. amplifier. The No. 57 is used as the "relay" tube in the "Q" circuit. One No. 56 tube is used as the oscillator and the other two as the push-pull first audio amplifier. The No. 55 tube is used as the demodulator. The two No. 2A3 super-triode tubes are used in the push-pull power output stage. The No. 5Z3 rectifier is used in the power supply.

A Bi-resonator is used to couple the antenna to the R. F. amplifier to prevent cross modulation. The R. F. amplifier is coupled to the mixer by a regular tuned R. F. transformer. This gives the tuning circuits (four-gang tuning capacitor) for R. F. selectivity ahead of the mixer, thus the image rejection ratio is extremely high. The oscillator is coupled to the cathode circuit of the mixer tube in the "Q" circuit. The I. F. output of the mixer tube is fed into Tetro-resonator (four-tuned circuit transformer) which is coupled to the I. F. amplifier tube. This tube is coupled to the No. 55 demodulator tube by a single-tuned transformer.

The resistor unit of the volume control potentiometer forms part of the load of the "audio" diode of the No. 55 tube, and the audio voltage is applied to the triode portion of this tube through the movable contact of this potentiometer. The potentiometer is double, the rear unit being used in the low level tone compensation circuit, which increases the response to bass frequencies and high frequencies in proper amount as the volume level is reduced. The output of the triode portion of the No. 55 tube is fed through a transformer to the push-pull first audio stage. The "Bass Control" circuit apparatus is connected across the primary of this transformer. The "Bass Control" switch is provided to remove the bass compensation by opening this circuit when it is desired to secure extremely high levels of sound output for dancing, etc. The AVC voltage is obtained from the other diode of the No. 55 tube, and is fed back to the first two tubes through a suitable filter.

The "Q" circuit for providing quiet operation for tuning between stations consists of the No. 57 relay tube connected to the "AVC" diode of the No. 55 tube. When there is no carrier coming in, the action of this circuit is to put high negative potentials on the "audio" diode and the control grid of the triode of the No. 55 tube, thus preventing reception of inter-carrier noise when tuning. When a carrier of suitable strength comes in, these negative potentials are removed and the signal is received. A switch in the rear of the chassis is provided, so that this "Q" circuit can be rendered inoperative if it is desired to use the maximum sensitivity of the receiver.

From the push-pull first audio stage the signal is coupled by a transformer to the super-triode push-pull power output stage. The "Adjustable Treble Control" circuit apparatus is connected across the primary of this coupling transformer to enable the user to adjust the proportion of high frequencies in the reproduction as he desires. Used in conjunction with the "Bass Control" a wide range of variation in the response characteristics can be obtained.

A large output transformer, large on account of the high audio power available in the system, is used to couple the super-triode tubes to the high quality electro-dynamic speaker.

The power supply employs three stages of filter, the first being of the resistance type, and the other two of the choke type. The speaker field is used as the choke in the third stage. The plate supply for the output tube is tapped off between the second and third stages of filter, while the remainder of the voltages are supplied from the voltage divider resistor.

(The servicing instructions for the Multi-Record Phonograph in the No. 51 Radio-Phonograph are in P-23221 Data Sheet.)

### CONTROLS

The accompanying cut shows the location and purpose of the controls on the front panel of the receiver, and the following paragraphs explain their use.

#### Station Selector

No description of this control is necessary as its operation is usual and normal.

#### On-Off Switch and Adjustable Treble Control

The On-Off switch is turned to "On" by clockwise rotation. Further rotation in a clockwise direction gradually reduces the response to the high audio or treble frequencies. When in a full clockwise position the minimum response to the highs is obtained. The full audio range is again obtained by turning the knob counter-clockwise until just before the On-Off switch turns "Off".

#### Volume Control

This control is operated in the usual manner, turning clockwise for higher volume levels. Operated simultaneously with this Volume Control is the low level tone compensation circuit, which increases the relative response to low and high audio frequencies as the volume level is reduced. This gives the effect of "constant fidelity" to the ear.

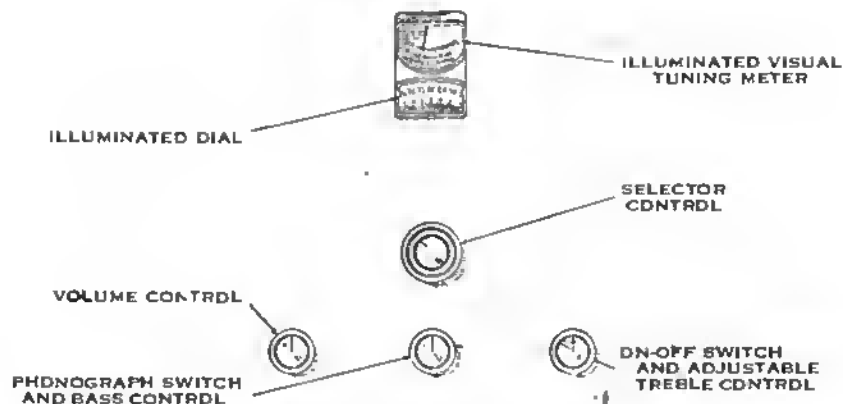


Fig. 1. Location of Controls.

### Phonograph Switch and Bass Control

When this knob is turned counter-clockwise from the normal position, the input of the audio system is switched to the phonograph circuits in such a manner that the Volume Control knob is used for controlling the level of reproduction of phonograph recordings. When turned clockwise from the normal position, this control reduces the response at the low audio or bass frequencies. This position is used when it is desired to obtain extremely high sound levels from the receiver without over-loading.

### "Q" Switch

This control is a toggle switch located on the rear of the chassis. When the lever is in the "Down" position the "Q" circuit is operating.

### Hum Balancer

This is a potentiometer located on the rear of the chassis with means for adjusting by a screwdriver. It should be adjusted only when the Volume Control is at minimum and the "Q" Switch is in the "Up" position.

## ALIGNMENT OF RECEIVERS

Realignment of the R. F. and Oscillator Tuning circuits when necessary may be accomplished in the following manner:

If a test oscillator and output meter are used, the signal strength applied to the receiver should be low enough so that the automatic volume control is not operated in order to avoid apparent broad adjustment. If broadcast signals are used, moderately strong signals which swing the meter pointer about half the distance back toward the "Off" position should be used.

With whichever method is used, the receiver should be tuned to a 1400 kc. signal first, and the Antenna, R. F. and Oscillator Shunt Aligners adjusted for best setting. Next the receiver should be set at 600 kc. on the dial, and the Oscillator Series Aligner ONLY adjusted for best position for maximum background noise. After this is done re-check the Oscillator Shunt Aligner at 1400 kc., using same dial setting as previously. The receiver should be left turned "On" for about fifteen minutes before aligning.

The Intermediate Amplifier circuits are aligned on oscillographs to obtain the proper shape of resonance curves having "steep" sides to get proper selectivity and fidelity. "Peak" methods of alignment (with oscillator and meter) do not give the desired curve, as it may be broad and unsymmetrical although a high peak is indicated. The adjustment of these circuits is very stable as shown by field experience and Proving Division tests. Therefore, as these adjustments cannot be duplicated exactly without the oscillograph equipment, it is recommended that the I. F. circuits never be adjusted by a service man.

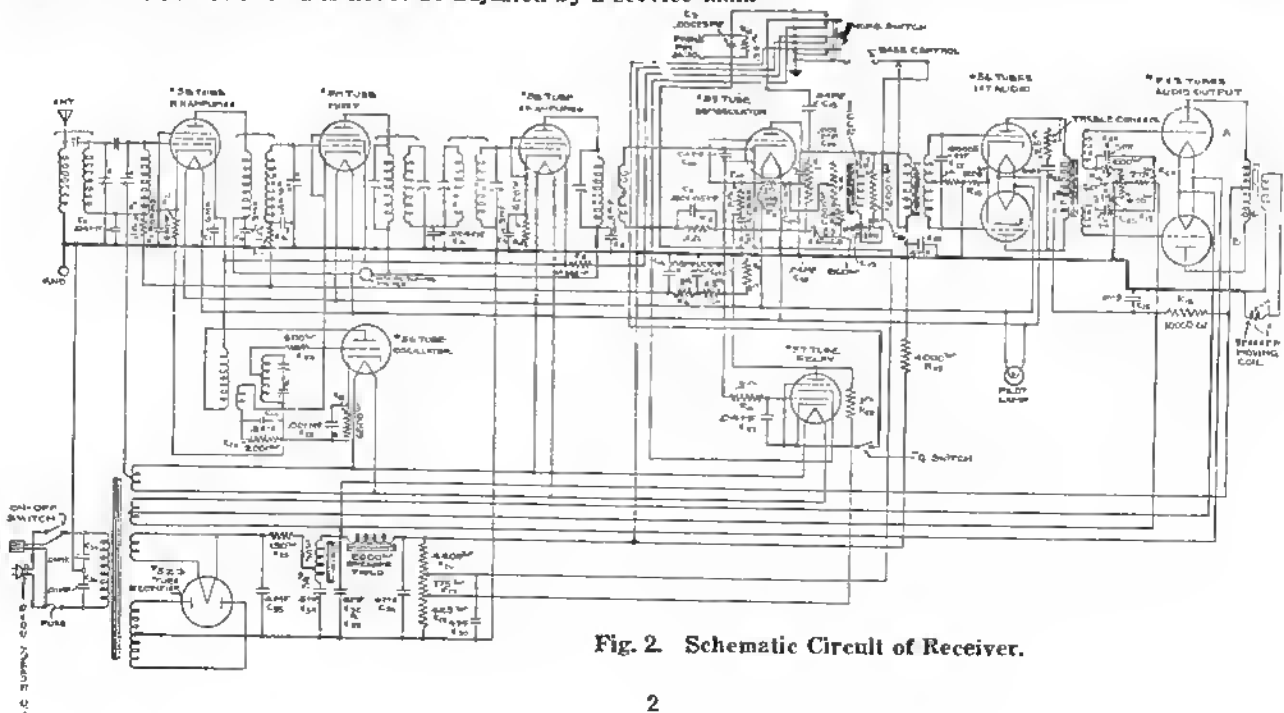


Fig. 2. Schematic Circuit of Receiver.

## NORMAL VOLTAGE READINGS

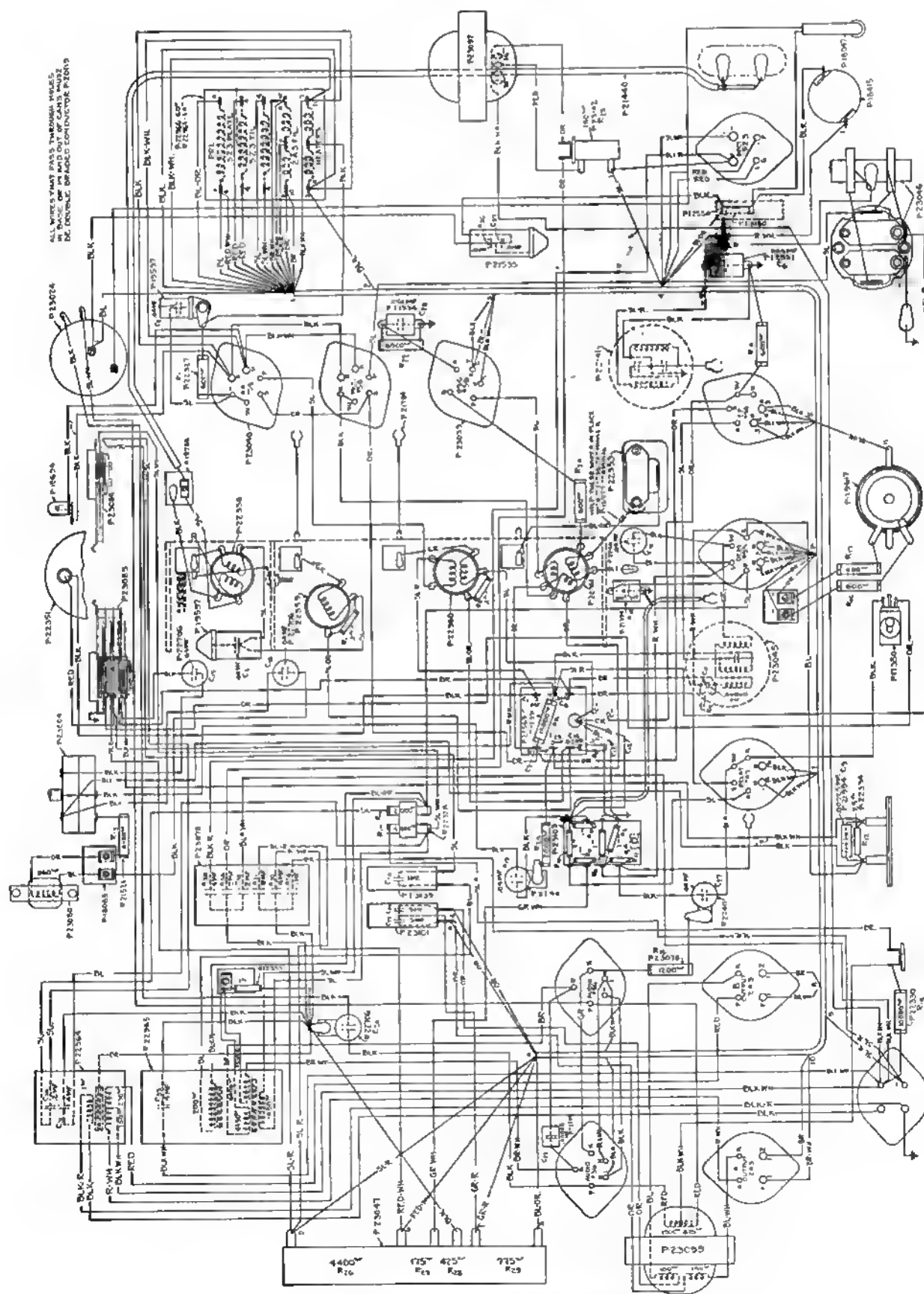
These voltage readings correspond to a line voltage at 120 volts. When voltages are measured, proper allowances should be made for a difference in line voltage above or below 120 volts. Be sure to make these readings with the Meter and Scale indicated, otherwise the results will not agree with those tabulated. Alternating voltages are indicated in italics. The dial should be set at about 1000 kc. The "Q" switch should be set in the "Up" position so that the "Q" circuit is not operating.

Voltage	Meter	Scale	Where Measured	Approx. Value in Volts
Heater Voltages Nos. 56, 57, and 58 Tubes	A. C.	0-4	Across Heater Terminals of Sockets	2.5
Filament Voltages Nos. 2A3 Tubes	A. C.	0-4	Across Filament Terminals of Audio Output Sockets	2.5
Filament Voltage No. 5Z3 Tube	A. C.	0-8	Across Filament Terminals of No. 280 Rectifier Socket	5.
Plate Voltage Radio Amplifier Tube	D. C.	0-250	Between Plate Terminal of R. F. Amplifier Socket (+) and Chassis Base (-)	200
Plate Voltage Mixer Tube	D. C.	0-250	Between Plate Terminal of Mixer Socket (+) and Chassis Base (-)	200
Plate Voltage Oscillator Tube	D. C.	0-250	Between Plate Terminal of Oscillator Socket (+) and Chassis Base (-)	95
Plate Voltage I. F. Tube	D. C.	0-250	Between Plate Terminal of I. F. Socket (+) and Chassis Base (-)	200
Plate Voltage Demodulator Tube	D. C.	0-250	Between Plate Terminal and Demodulator Socket (+) and Chassis Base (-)	170
Plate Voltage First Audio Tube	D. C.	0-250	Between Plate Terminal of First Audio Socket (+) and Chassis Base (-)	220
Plate Voltages Audio Output Tubes	D. C.	0-750	Between Plate Terminals of Audio Output Sockets (+) and Chassis Base (-)	345
"C" Voltage R. F. Amplifier Tube	D. C.	0-10	Between Cathode Terminal of R. F. Amplifier Socket (+) and Chassis Base (-)	4
"C" Voltage Mixer Tube	D. C.	0-10	Between Cathode Terminal of Mixer Socket (+) and Chassis Base (-)	8
"C" Voltage Oscillator Tube	D. C.	0-250	Between Cathode Terminal of Oscillator Socket (+) and Chassis Base (-)	25
"C" Voltage I. F. Tube	D. C.	0-10	Between Cathode Terminal of I. F. Socket (+) and Chassis Base (-)	4
"C" Voltage First Audio Tube	D. C.	0-250	Between Cathode Terminal of First Audio Sockets (+) and Chassis Base (-)	12
"C" Voltage Audio Output Tube	D. C.	0-250	Across 775-ohm Biasing Resistor	50
Grid Voltage Triode of Demodulator Tube	D. C.	0-250	Between Cathode Terminals of Demodulator Socket (+) and Green-Wire on "D" Slick (-)	8
Screen Voltages R. F. Mixer and I. F. Tubes	D. C.	0-250	Between Screen Terminals on Sockets (+) and Chassis Base (-)	95
"B" Voltage R. F. Mixer, I. F. First Audio and Demodulator Tube	D. C.	0-250	Between High Side of Voltage Divider (+) and Chassis Base (-)	200
"B" Voltage Audio Output Tubes	D. C.	0-750	Between Mid-Tap of Output Transformer (+) and Chassis Base (-)	350
Speaker Field Volts	D. C.	0-250	Across Small Pin on Speaker Connector Socket	115
Plate Voltage A. C. per Audio No. 5Z3 Rectifier Tube	A. C.		Between Plate Terminals of No. 5Z3 Rectifier Socket and Chassis Base	380

## CONTINUITY READINGS OF CHASSIS

All readings taken from designated terminal to chassis base unless otherwise specified and are indicated in ohms as read on a Weston Model 683 Ohmmeter. The G terminals of the Nos. 55, 57, and 58 tubes are connected to the top caps.

Tube	H	H	K	8U	S	P	G	Remarks
R. F. (56)	0	0	600	600	20,000	5,000	1,450,000	
Mix (56)	0	0	2000	2600	20,000	5,000	1,450,000	8D and S terminals of Demodulator Socket are diode plates.
Osc (56)	0	0	0500			20,000	600	NOTE A With phone switch on, Res. is from 1 megohm to 400,000 ohms, varying with volume control.
I. F. (55)	0	0	600	600	20,000	5,000	70	
Demod. (55)	0	0	600	100,000	1,000,000	10,450	2,100,000	
Relay (57)	0	0	{ See Note B } Open=0		100,000	100,425	{ See Note A } 1,500,000	NOTE B Open when switch is in up position, 600 ohms when switch is in down position and relay tube is operating.
1st Aud. (56) 1st	0	0	1200			{ See Note C } 11,065	5,000	
1st Aud. (56) 2nd	0	0	1200			{ See Note C } 11,690	6,500	NOTE C Readings taken from designated terminal to either "H" terminal of rectifier (5Z3) socket.
2nd Aud. (2A3) 1st	F	F				{ See Note C } 340	1,100	
2nd Aud. (2A3) 2nd	F	F				{ See Note C } 420	1,100	NOTE D Taken from H-H terminals to either P terminal of 2nd audio (output) sockets.
Rect. (2Z3)	{ See Note D } 340 - 420					27	27	



**Fig. 3. Wiring Diagram of Chassis.**

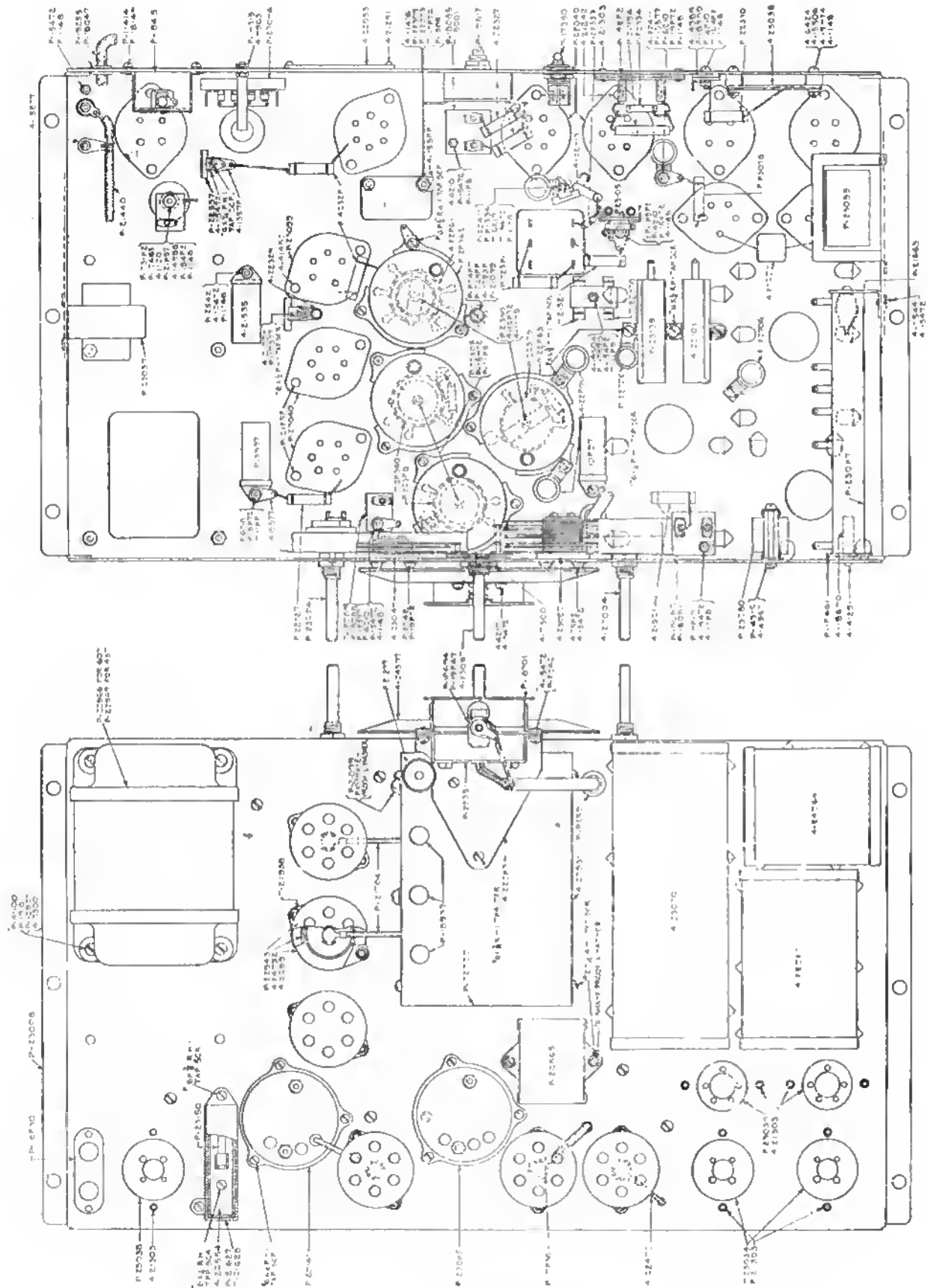


Fig. 4. Chassis Assembly.

# REPLACEMENT PARTS

Piece Number	Part	Description of Part	Required per Receiver	Base Price Each
P-22965	Audio Transformer, Assembly	Audio Transformer, Compensator Choke and Capacitor Assembly	1	\$ 7.25
P-21334	Capacitor	.001 Mfd.	2	.60
P-22337	Capacitor	.004 Mfd.	1	.60
P-22411	Capacitor	.042 Mfd.	2	.70
P-22704	Capacitor	.032 Mfd.	4	.50
P-22353	Capacitor	Oscillator Series Aligner	1	.80
P-22365	Capacitor Assembly	R. F. and I. F. By-Pass Capacitors	1	3.05
P-23070	Capacitor Assembly	Filter Capacitor Assembly	1	10.00
P-10697	Capacitor Assembly	.012 Mfd.	2	.60
P-21535	Capacitor Assembly	2 - .01 Mfd.	1	.35
P-23130	Capacitor Assembly	1 Mfd.	1	1.00
P-23101	Capacitor Assembly	2 - .5 Mfd.	1	1.25
P-22599	Capacitor	.00005 Mfd.	1	.15
P-21991	Capacitor	.00025 Mfd.	1	.40
P-22368	Coil Assembly	First Coil of Hi-Resonator	1	1.60
P-22359	Coil Assembly	Second Coil of Hi-Resonator	1	1.85
P-22360	Coil Assembly	R. F. Transformer	1	2.65
P-22361	Coil Assembly	Oscillator	1	2.65
P-23080	Choke Assembly	Tone Compensator	1	1.00
P-23150	Fuse	2 Amperes	1	.12
P-10630	Grid Clip		1	.12
P-21704	Grid Clip Assembly		1	.22
P-22872	Grid Clip Assembly		1	.37
P-23016	I. F. Transformer	First Unit of 1st I. F. Transformer	1	2.10
P-23141	I. F. Transformer	2nd Unit of 1st I. F. Transformer	1	2.35
P-23045	I. F. Transformer	2nd I. F. Transformer	1	2.10
P-23007	Inductor Assembly	Filter Inductor "R" Choke	1	2.00
P-21277	Knob	Antenna Aligner	1	.17
P-22300	Knob	Selector Control	1	.27
P-23139	Knob	Volume, Phone-Compensator and Clarifier Controls	2	.20
P-22351	Meter	Visual Tuning Meter	1	4.20
P-23004	Potentiometer	Volume and Compensator Control	1	2.60
P-23024	Potentiometer	Clarifier and On-Off Switch	1	1.35
P-10617	Potentiometer	Hum Adjuster	1	.90
P-22142	Resistor, 150 Ohms	Filter Resistor (Wire Wound)	1	.55
P-23047	Resistor, 5,775 Ohms	Voltage Divider (Wire Wound)	1	2.00
P-22327	Resistor, 600 Ohms, "C" Type	Carbon Resistor, Blue, Black, and Brown	5	.37
P-23078	Resistor, 1,200 Ohms, "C" Type	Carbon Resistor, Brown, Red, and Red	1	.37
P-21521	Resistor, 2,000 Ohms, "C" Type	Carbon Resistor, Red, Black, and Red	2	.37
P-22328	Resistor, 4,000 Ohms, "C" Type	Carbon Resistor, Yellow, Black, and Red	1	.37
P-22329	Resistor, 6,500 Ohms, "C" Type	Carbon Resistor, Blue, Green, and Red	1	.37
P-22350	Resistor, 10,000 Ohms, "C" Type	Carbon Resistor, Brown, Black, and Orange	1	.37
P-22351	Resistor, 15,000 Ohms, "C" Type	Carbon Resistor, Brown, Green, and Orange	1	.37
P-22333	Resistor, 100,000 Ohms, "D" Type	Carbon Resistor, Brown, Black, and Yellow	5	.37
P-22334	Resistor, 250,000 Ohms, "D" Type	Carbon Resistor, Red, Green, and Yellow	2	.37
P-22335	Resistor, 500,000 Ohms, "D" Type	Carbon Resistor, Green, Black, and Yellow	1	.37
P-22561	Resistor, 1 Megohm, "D" Type	Carbon Resistor, Brown, Black and Green	1	.37
P-22871	Resistor, 2 Megohm, "D" Type	Carbon Resistor, Red, Black, and Green	1	.37
P-23038	4 Pin Socket		4	.17
P-23039	5 Pin Socket		3	.17
P-23040	6 Pin Socket		6	.17
P-23060	Transformer	Input Push-Pull Transformer	1	2.25
P-22964	Transformer	Output Push-Pull Transformer and Capacitor Assembly	1	6.75
P-22066	Transformer	Power, 60 Cycles, 110 Volts	1	7.50
P-22067	Transformer	Power, 25 Cycles, 110 Volts	1	13.25